Claims 11-14 and 36 have been withdrawn from consideration by the Examiner.

Reconsideration of the rejection of the claims in issue under 35 U.S.C. §102 over Hesler et al. 4,002,999(A) and Hesler et al. 3,914,680(B), and the rejection of the Claim 7 under 35 U.S.C. §103 over Hesler et al.(B), are respectfully solicited. The reasons for reconsideration are set forth below.

Reconsideration of the rejections of claim 1 and claims 2-5 and 8-10 dependent thereon is respectfully solicited.

Claim 1 has been amended to specify that both the first and second drive signal providing means include output windings of current transformers.

It is believed that claim 1 with this change clearly distinguishes applicant's invention from those of the Hesler et al. references. In both Hesler et al. patents, it is clear that the transformers of the degenerative circuits are voltage transformers and <u>not</u> current transformers. As a consequence the circuits of the Hesler et al. patents require current limiting resistors such as resistors 21, Figure 1 of Hesler et al.(B). These current limiting resistors cause substantial power dissipation and thereby reduce the efficiency of the inverter. Such power dissipation and reduced efficiency is eliminated in the inverter of applicant's invention by utilizing only current transformers for both positive and negative feedback. This feature is not suggested, and claim 1 is therefore believed allowable.

Reconsideration of the rejection of claims 2-3 and 5-10 is also requested. These claims all depend directly or indirectly on claim 1 and are believed allowable for substantially the same reasons as set forth above with regard thereto. These claims also define applicant's invention in greater detail and are believed allowable for additional reasons.

Claim 2 has been amended to delete reference to the magnetic core and to specify that the secondary winding of the first means of claim 1 is interconnected between the bases of the transistors

through a low resistance path. Creation of this low resistance path is necessary in the circuit of Fig. 4 to achieve rapid base charge removal and thus rapid transistor turn-off. In Hesler et al. (A) there is no interconnection and in Hesler et al.(B) the interconnection is made through current limiting resistors and not a low resistance path. Consequently, an effective short cannot be created between the bases of the switching transistors, as in applicant's invention.

In Claim 3, the creation of the effective short between the bases of the switching transistors when the transformer core saturates is expressly stated.

Claim 5 has been amended and specifies, inter alia that the second current transformer has a non-saturable magnetic core <u>separate and apart</u> from said saturable magnetic core. Both of the Hesler et al. patents, on the other hand, show the power transformer, the regenerative feedback transformer and the degenerative feedback transformer sharing a common apertured core.

This results in a number of disadvantages, and contrary to the Examiner's contention, providing separate cores is not a step backward in the art. Because Hesler et al. uses a single core, a single core material having fixed characteristics must be used for all three transformers. However, the three transformers perform different functions and therefore require cores having different characteristics to achieve optimum operation. For instance, for the power transformer a core material having high efficiency and good non-saturability characteristics, such as 3C8 Ferroxcube, is needed; On the other hand, the saturable feedback transformer requires a core material, such as 3E2A Ferroxcube, having a sharp saturability curve and low magnetization current characteristics.

The use of a common core by Hesler et al. creates other problems. It is desirable to have the frequency of operation independent of the inverter power. In Hesler et al. the power needs dictates a large volume and thus a large cross section. However, increased cross section causes a decrease in frequency of operation which at

a certain power level cannot be offset by reducing the number of turns since the number of turns cannot be reduced to less than one. A given high power application, 50 watts or more, for instance, may result in the necessity of operating the inverter at a frequency so low as to be in the audible range.

Moreover, operating a transformer between its saturation limits is very inefficient, and it is therefore very desirable to utilize a core for the saturable transformer having a volume as small as possible. With the single core of Hesler et al. performing multiple functions this becomes very difficult to achieve, if not impossible. The volume and cross section of one portion of the core effects the other portions which perform different functions. The Hesler et al. cores also have a long magnetic path length and resultant, but undesirable, large magnetization currents. Thus, the inverter of Hesler et al. requires a minimum load and is difficult to start. This is also due to the fact that an air gap is not provided in the power transformer core. However, such a gap is to be avoided for purposes of feedback. Accordingly, the avoidment of this minimum load requirement achieved in applicant's inverter is not obtained in the Hesler et al. circuits. Claim 5 is therefore believed allowable.

Claim 7 specifies that the inverter of Claim 5 includes a DC voltage source with positive and negative terminals and, inter alia, that the second current transformer has an output winding with a center tap connected to one of the terminals of that DC source. Claim 7 is believed allowable for the same reasons set forth above with respect to Claim 5. Further, as noted by the Examiner, such a showing is not present in the Hesler et al. references. Contrary to the indication by the Examiner, showing of a center tap on the coil of the regenerative circuit of Hesler et al. in no way suggests the center tap on the degenerative coil.

Claims 8-10 all depend from claim 1, and add additional recitations of structure or function with respect thereto. They are believed allowable for the same reasons set forth above with re-

spect to claim 1. These claims are believed allowable for further reasons. Claim 8 specifies that the drive circuit and the pair of switching transistors self-oscillate. The Hesler et al. circuits on the other hand are difficult to start and require additional starting circuitry. With regard to claim 9, it is specified that the inverter of Claim 1 includes a capacitor connected between the collectors of the transistors to restrain the rate of rise of the collector voltage after transistor turn-off. As explained at page 10 of the specification, this restraint on rise insures that the switching transistor is completely turned off before high collector voltage is achieved. This is necessary to optimize power dissipation minimization in the transistors during the turn-off transition. While a capacitor is shown in Figure 6 of Hesler et al.(B) and in Figure 1 of Hesler et al.(A), these capacitors in no way function to restrain the rate of rise of the collector voltage.

Reconsideration of the rejection of claim 15 and claim 16 dependent thereon is respectfully solicited. Claim 15 defines an electrical inverter circuit comprising, inter alia, drive control means effective to provide reverse bias to the base-emitter junctions of two switching transistors during periods when their collector-emitter voltages are significantly greater than the transistor collector-emitter saturation voltages. Referring to Figure 2 of the present application, this negative bias is seen to be applied to transistor 12 substantially throughout the period between time t_3 and t_8. It is clear that such a reverse bias is not applied to the base-emitter junctions of the transistors of any of the Hesler et al. circuits when the collector-emitter voltages thereof are significantly greater than the saturation of voltages. Allowance of claim 15 is therefore requested.

Claims 16-21, are dependent on claim 15 and are believed allowable for the same reasons as set forth above with regard thereto. These claims are believed allowable for additional reasons, as set forth below.

Claim 16 specifies that the inverter circuit of claim 15 includes an output transformer having significant shunt leakage inductance connected to the collectors of the transistors and effective to produce a "flywheel" effect, i.e. alternate, rapid rising voltage swings at the collectors of the transistors. A review of the Hesler et al. references fails to reveal any indication of such significant shunt leakage and consequently Hesler et al. circuits will not start except possibly with large inductive loads.

Claim 17 specifies that the inverter circuit of claim 16 includes a capacitor effectively connected in parallel with the transformer and effective to limit the rate of voltage rise and decline at the collectors of the transistors. As already explained with reference to claim 9, such a capacitor is not shown by either of the Hesler et al. patents.

Claim 18 specifies that the inverter of claim 17 is self-oscillating. As already noted above, the Hesler et al. references require separate starting circuits and are not self-oscillating except possibly when connected with large inductive loads.

Claim 21 specifies that the reverse bias means of the inverter of claim 15 includes a non-saturable current transformer. As previously explained, such a current transformer is lacking in the Hesler et al. references.

Reconsideration of rejection of claim 22 and claim 23 dependent thereon is respectfully requested. Claim 22 defines an inverter circuit comprising, inter alia, a pair of alternately conducting switching transistors, each of which has a cyclical emitter-collector voltage waveform characterized by four distinct periods within each cycle. It is further specified that the drive control means connected to the base-emitter junction of each transistor and operable to maintain each reversely biased during all periods except when the emitter-collector voltage is low and substantially constant. As already noted, a review of the Hesler et al. references reveals that such a reverse bias is not maintained in all the periods, as defined in claim 22.

Claim 23 specifies that the drive control means of claim 22 biases the base-emitter junctions forwardly during the period when its collector voltage is low and substantially constant. Reference to Figure 3a of Hesler et al., for instance, indicates that such is not the case in the Hesler et al. inverters. Allowance of claims 22 and 23 are therefore requested.

Reconsideration of the rejection of claim 25 and claims 26-34 dependent thereon is requested. Claim 25 defines a control means in an electrical inverter circuit having a pair of first and second switching transistors in which the control means applies to the base-emitter junction of each transistor a control signal effective to turn it on only after its collector voltage drops substantially to its lowest level prior to the control signal being applied thereto. There is no showing that such is the case in either of the Hesler et al. references. In fact, reference to the various waveforms shows only schematic representations of the collector voltage, such that a determination cannot be made as to when the lowest collector voltage prior to application of a turn-on signal occurs.

Claims 31 and 33 are dependent on claim 25 and are believed allowable for the same reasons as set forth above with regard thereto. In addition, claim 31 specifies that the control means functions to render the inverter circuit self-oscillating. As previously stated, in the Hesler et al. circuits, a separate starting circuit is required.

With regard to claim 33, the inverter circuit of claim 25 is defined as including first and second diodes shunting the base-emitter junctions of the first and second transistors. It is also specified that each of said first and second transistors is operable to function as a clamp to respectively limit the voltage rise of the collector of the other transistor to twice the magnitude of the unidirectional input voltage. In the preferred embodiment of Figure 1, these diodes are diodes 22 and 23. As described at page 11 of the specification, for instance, the transistor 13 and diode

23 function as a clamp to limit the magnitude of the voltage at the collector of transistor 12 at time t_4 and thereafter. Referring to Figure 5 of Hesler et al.(B) it is seen that the diodes 25 and 26 connected to the bases of switching transistors 16 and 17, respectively, are poled in opposite directions to those of diodes 22 and 23 of applicant's invention shown in Figure 1. These diodes of Hesler et al. function as commutating diodes and in no way function in the manner specified in claim 25.

Reconsideration of the rejection of claim 35 is requested. Claim 35 has been amended and defines an inverter having, inter alia, a power transformer with a core, a transformer with a saturable core separate and apart from the power transformer core and another transformer with a core separate and apart from said power transformer core. Thus, this claim clearly distinguishes over the single core circuits of Hesler et al., and, as noted above, enables achievement of various advantages not obtainable by Hesler et al..

New claims 45 and 46 are dependent on claim 33 and are likewise believed allowable. Claim 45 specifies that the cores of the first and second means of the inverter of claim 35 are also separate and apart from one another. Claim 46 specifies that both transformers are current transformers.

Reconsideration of the rejection of claim 37 and claims 38-41 and 44 dependent thereon is requested. Claims 42 and 43 have been cancelled without prejudice and the recitations of structure previously contained therein, have now been incorporated by amendment into claim 37. Claim 37 now specifies, inter alia, a diode means for preventing said second signal from being applied to the non-conducting one of the transistors. In the preferred embodiment, the preventing means comprises diodes 24 and 25. It is clear that such a preventing means is neither shown nor suggested in either of the Hesler et al. references. Claim 37 and claims 38-41 and 44 are therefore believed allowable.

Allowance of new claims 47 and 48 are requested for reasons discussed above. Claim 47 specifies that in the inverter of

claim 1 both transformers have magnetic cores separate and apart from one another. Claim 48 specifies that the inverter of claim 47 includes a power transformer with a magnetic core which is separate and apart from the magnetic cores of the transformers of the first and second means.

Reconsideration and allowance of all claims at issue are respectfully solicited.

Respectfully submitted,

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James W. Potthast, #26,792
REGISTERED ATTORNEY FOR APPLICANT

DATE 12-15-80

The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Account No. 04-1880.